

Claims

1. A heat-shrinkable polyester film satisfying following requirements (A) to (E):

(A) a heat shrinkage percentage in a maximum shrinkage direction of a sample is 10% to 50%,

wherein, the sample is prepared and treated under following conditions:

a heat-shrinkable polyester film is cut into a shape of a square measuring 10 cm × 10 cm;

the sample obtained is immersed in hot water at 70°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

(B) a heat shrinkage percentage of a sample in a maximum shrinkage direction is not less than 75%, and a heat shrinkage percentage in a direction orthogonal to the maximum shrinkage direction is not more than 10%,

wherein, the sample is prepared and treated under following conditions:

a heat-shrinkable polyester film is cut into a shape of a square measuring 10 cm × 10 cm;

the sample obtained is immersed in hot water at 85°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

(C) a heat shrinkage percentage difference of a sample ΔX (%) represented by a following equation is 10% to 20%,

$$\Delta X = X_0 - X_{10}$$

wherein, X_0 and X_{10} are defined as follows;

X_0 : a heat shrinkage percentage in a maximum shrinkage direction of a sample obtained by cutting a heat-shrinkable polyester film into a shape of a square measuring 10 cm \times 10 cm;

X_{10} : a heat shrinkage percentage in a maximum shrinkage direction of a film obtained by cutting a heat-shrinkable polyester film having experienced heat shrink by 10% in a maximum shrinkage direction; and

wherein, the sample obtained is immersed in hot water at 95°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

(D) a three-dimensional surface roughness $S\Delta a$ is 0.008 to 0.04;

(E) a three-dimensional surface roughness SR_z is 0.6 to 1.5 μm .

2. A heat-shrinkable polyester film satisfying following requirements (A) to (C), (F) (G):.

(A) a heat shrinkage percentage in a maximum shrinkage direction of a sample is 10% to 50%,

wherein, the sample is prepared and treated under following conditions:

a heat-shrinkable polyester film is cut into a shape of a square measuring 10 cm \times 10 cm;

the sample obtained is immersed in hot water at 70°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds, and

then withdrawn from the water;

(B) a heat shrinkage percentage of a sample in a maximum shrinkage direction is not less than 75%, and a heat shrinkage percentage in a direction orthogonal to the maximum shrinkage direction is not more than 10%,

wherein, the sample is prepared and treated under following conditions:

a heat-shrinkable polyester film is cut into a shape of a square measuring 10 cm \times 10 cm;

the sample obtained is immersed in hot water at 85°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

(C) a heat shrinkage percentage difference of a sample ΔX (%) represented by a following equation is 10% to 20%,

$$\Delta X = X_0 - X_{10}$$

wherein, X_0 and X_{10} are defined as follows;

X_0 : a heat shrinkage percentage in a maximum shrinkage direction of a sample obtained by cutting a heat-shrinkable polyester film into a shape of a square measuring 10 cm \times 10 cm;

X_{10} : a heat shrinkage percentage in a maximum shrinkage direction of a film obtained by cutting a heat-shrinkable polyester film having experienced heat shrink by 10% in a maximum shrinkage direction; and

wherein, the sample obtained is immersed in hot water at 95°C for 5 seconds and then withdrawn from the hot water, and subsequently is immersed in water at 25°C for 10 seconds,

and then withdrawn from the water;

(F) a light transmission at a wavelength of 380 nm is not more than 20%, and a light transmission at a wavelength of 400 nm is not more than 60%;

(G) a Haze value is not more than 15%.

3. A film roll of a heat-shrinkable polyester film having a length of 1000 to 6000 m, the heat-shrinkable polyester film satisfying following requirements (a) to (c):

(a) an average of heat shrinkage percentages in a maximum shrinkage direction of samples is 10% to 50%,

wherein, the samples are obtained in a following manner: an initiation end of winding of a film of steady region giving stable film properties in a longitudinal direction is defined as a first end, and a termination end of winding thereof is defined as a second end;

a first cut-off point of the samples of the film is provided less than 2 m inside of the second end, and a final cut-off point is provided less than 2 m inside the first end;

a plurality of sample cut-off points are provided at an interval of about 100 m from the first cut-off point, and the samples are obtained by cutting into a shape of a square measuring 10 cm x 10 cm at each sample cut-off point; and

wherein the samples are treated in a following manner: the samples obtained are immersed in hot water at 70°C for 5 seconds and then withdrawn from the hot water, and subsequently immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

(b) an average of heat shrinkage percentages in a maximum shrinkage direction of samples is not less than 75%, and a heat

shrinkage percentage in a direction orthogonal to the maximum shrinkage direction is not more than 10%,

wherein, the samples are treated in a following manner:

each sample in a shape of a square measuring 10 cm × 10 cm is separately cut from each cut-off point of sample in the requirement (a);

the obtained samples are immersed in hot water at 85°C for 5 seconds, and then withdrawn from the hot water, and subsequently, immersed in water at 25°C for 10 seconds, and then withdrawn from the water; and

(c) a heat shrinkage percentage difference ΔX (%) of samples at all cut-off points of samples represented by following equation is in a range of 10% to 20%,

$$\Delta X = X_0 - X_{10}$$

wherein, X_0 and X_{10} are defined as follows,

X_0 : a heat shrinkage percentage in a maximum shrinkage direction measured for each sample in a shape of a square measuring 10 cm × 10 cm separately cut from each cut-off point of sample in the requirement (a) being immersed for 5 seconds in hot water at 95°C, then withdrawn from the hot water, and subsequently, being immersed in water at 25°C for 10 seconds, and then withdrawn from the water;

X_{10} : a heat shrinkage percentage in a maximum shrinkage direction measured in a same manner for each sample obtained by cutting into a shape of a square measuring 10 cm × 10 cm after shrunk by 10% in a maximum shrinkage direction of a cut sample in a shape of a square measuring 25 cm × 25 cm separately cut from each cut-off point of sample in the requirement (a).